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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

UHLIR, NIKOLAS J

ART UNIT	PAPER NUMBER
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1773

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DATE MAILED: 03/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/749,473

Applicant(s)

IKEDA, HIROYUKI

Examiner

Nikolas J. Uhler

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

This office action is in response to the amendment and arguments dated 2/3/03. Currently, claims 1 and 3-14 are pending. Applicants cancellation of claim 2 renders the prior 35 U.S.C 112 rejection moot. Thus, this rejection is hereby withdrawn. Applicants insertion of the limitations of claim 2 into claim 1 render the prior 35 U.S.C 102 rejection untenable. Thus, this portion of the rejection is withdrawn. However, applicants arguments regarding the prior 35 U.S.C 103(a) rejections are deemed to be unpersuasive, as will be discussed below in the section entitled "Response to Arguments."

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 3, and 10-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 3 recites the limitation "the adjacent soft magnetic layers" in lines 3-4 of the claim. There is insufficient antecedent basis for this limitation in the claim. Specifically, there is no recitation in claim 1 that the soft magnetic layers are adjacent to one another. Also, it is unclear to the examiner how layers can be adjacent (i.e directly next to one another), if a layer is separating them. Clarification and correction is required.

4. Claims 10-12 recite the limitation, "the soft magnetic layer." It is unclear to the examiner as to which of the two soft magnetic layers the applicant is referring. There is no requirement in claim 1 that the soft magnetic layers be the same, so this reference is ambiguous. Clarification is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-7 and 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. (US4687712) in view of Hokkyo et al. (US6387483), and Michaelsen et al. (US4245008).

7. Regarding the limitations of claim 1, wherein the applicant requires a magnetic recording medium comprising a non-magnetic substrate, and at least one magnetic layer formed on the substrate via at least two soft magnetic layers divided by a separate layer therebetween, wherein the surface roughness R_a of the medium is at most 50 angstroms, and the product $\mu_{\max} \cdot t$ of the maximum permeability (μ_{\max}) and the thickness (t) is at least 1,000,000 H*a/m.

8. With respect to these limitations, Sugita et al. teaches a vertical (perpendicular) magnetic recording medium comprising a substrate that has been coated with alternating layers of permalloy and a non-magnetic layer, wherein a vertical magnetic recording medium is deposited on the outermost permalloy layer (column 2, line 65-

column 3, line 10). It is well known in the art that Permalloy is a soft magnetic material. Further, Sugita et al. specifically teaches an example, wherein a 50 μ m thick polymer substrate is coated with a triple layer structure of permalloy/non-magnetic material, wherein the triple layer comprises a 600 angstrom thick upper permalloy layer, a 600 angstrom thick intermediate permalloy layer, a 2000 angstrom thick lower permalloy layer, a 150 angstrom thick titanium layer positioned between the upper permalloy layer and the intermediate permalloy layer, a 150 angstrom thick titanium layer positioned between the lower permalloy layer and the intermediate permalloy layer, and a Co-Cr perpendicular recording layer on the upper permalloy layer (column 6, lines 22-35). Lastly, Permalloy is well known in the art to be comprised of various NiFe alloys. The applicant admits on page 11 of the specification that NiFe alloys have a μ_{max} of ~ 330 H/m. Thus, for the example above wherein 3200 angstroms of permalloy employed, the soft magnetic material will exhibit a $\mu_{max} \cdot t$ of 1056000 H \cdot a/m, thus meeting this limitation.

9. However, Sugita does not teach a magnetic recording medium wherein the medium has a surface roughness Ra of <50 angstroms, as required by claim 1.

10. With respect to this deficiency, Hokkyo et al. teaches a perpendicular magnetic media that comprises a substrate that has been coated with a thin smoothness control layer, wherein the smoothness control layer is further coated with a soft magnetic layer and the soft magnetic layer is coated with a perpendicular magnetic recording layer (column 2, lines 8-14). Hokkyo states that in perpendicular magnetic recording media, poor surface smoothness of the soft magnetic layer degrades the perpendicular

orientation of the perpendicular magnetic layer formed on the soft magnetic layer (column 1, lines 60-67). Hokkyo teaches that adding a smoothness control layer that possesses excellent surface smoothness results in subsequent layers formed on top of the smoothness control layer also exhibiting improved smoothness (column 2, lines 15-25). Magnetic media with improved surface smoothness exhibit higher recording density, lowered noise, and improved read output voltage (column 2, lines 23-25).

11. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add a smoothness control layer as taught by Hokkyo between the substrate and the first soft magnetic layer taught by Sugita et al.

12. One would have been motivated to make this modification due to the teaching in Hokkyo that the smoothness of a magnetic recording medium can be improved through the addition of a smoothness controlling layer between the substrate and a soft magnetic layer in a magnetic recording medium, and that improving the smoothness of the media results in improved recording density, noise, and read output voltage.

13. Further, referring to figures 7 and 8 of Hokkyo, it is clearly shown that the smoothness control layer improves the roughness of the soft magnetic layer, and that there is a strong correlation between the roughness of the magnetic recording layer and the roughness of the soft magnetic underlayer film. Thus, as the smoothness control layer serves to improve the surface roughness of the soft magnetic layer, it necessarily improves the smoothness of the magnetic recording layer (column 10, lines 34-47). More specifically, as the roughness of the smoothness control layer increases, the roughness of subsequent layers increases, whereas if the roughness of the smoothness

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control layer decreases, the smoothness of subsequent layers also decreases. Thus, the examiner takes the position that the smoothness of the magnetic smoothness control layer is a results effective variable, and it would have been obvious to one of ordinary skill in the art to optimize the smoothness control layer to be as smooth as possible in order to obtain a magnetic recording layer that is as smooth as possible.

14. Regarding claim 3, wherein the applicant requires the recording medium to have between 2-20 soft magnetic layers, with a separate layer between adjacent soft magnetic layers. This limitation is met as set forth above for claim 1.

15. Regarding claim 4, wherein the applicant requires to total thickness of the soft magnetic layers and the separate layers to be in the range of 500-10,000 angstroms. This limitation is met by the example cited above for claim 1, which has a total thickness (permalloy + separator layers) of 3500 angstroms.

16. Regarding claims 5 and 6, wherein the applicant requires the ratio of the thickness of the soft magnetic layers to the thickness of the separator layers to be in the range of 1:0.05-1:0.5, more specifically 1:0.07-1:0.2. This limitation is met by the example stated above for claim 1, wherein the ratio of total permalloy thickness/total separator thickness is 1/.09375 (3200/300).

17. Regarding claim 7, wherein the applicant requires the separate layers to be non magnetic. This limitation is met by the example stated above for claim 1, which utilize Ti (a known non magnetic) as the material for the separator layers.

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18. Regarding claim 9, wherein the applicant requires the thickness of the separator layers to be in the range of 50-300 angstroms, this limitation is met as set forth above for claim 1, as the example taught utilizes 150 angstrom thick separator layers.

19. Regarding claim 10, wherein the applicant requires the maximum permeability of the soft magnetic material is in the range of 10-1,000,000 H/m. this limitation is met as set forth above for claim 1, as permalloy is a known NiFe alloy, which applicant admits on page 11 of the specification has a maximum permeability of 320 H/m.

20. Regarding claim 11, wherein the applicant requires the soft magnetic to have coercivity ≤ 100 oersted. This limitation is met by the example stated above for claim 1, which utilizes permalloy as the soft magnetic material. Permalloy is known in the art to have a coercivity below 50 oersted, as shown by Michaelsen (column 2, lines 65-68).

21. Regarding claim 12, wherein the applicant requires, the soft magnetic layer to be made of NiFeMo or NiFe alloy. This limitation is met as set forth above for claim 1, as Permalloy is a known NiFe alloy.

22. Regarding claim 13, wherein the applicant requires the medium to be a perpendicular recording medium. This limitation is met as set forth above for claim 1.

23. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. as modified by Hokkyo et al. as applied to claims 1-7, and 9-13 above, and further in view of Lal et al. (US5834111).

24. Sugita et al. as modified by Hokkyo et al. does not teach a magnetic recording medium that comprise a substrate that has been coated with a plurality of alternating

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layers of a soft magnetic layer and a separation layer, wherein the separation layer comprises chromium or an alloy containing chromium as the main component, as required by claim 8.

25. However, Lal et al. teaches a magnetic recording medium comprising a substrate, a chromium underlayer formed on the substrate, a multilayer magnetic film comprising 1st and 2nd magnetic layers formed on the chromium underlayer, an isolation layer between the first and second magnetic layers, and a wear resistant over coat (column 1, lines 62-67). The non-magnetic isolation layer is manufactured from one of chromium, titanium, molybdenum, zirconium aluminum, etc.... (Column 4, lines 8-15)

26. Therefore it would have been obvious to one of ordinary skill in art at the time the invention was made to substitute chromium for titanium as the spacer layers in the multilayer magnetic media taught by Sugita et al. as modified by Hokkyo et al.

27. One would have been motivated to make this modification due to the teaching in Lal et al. that titanium and chromium are equivalent materials for use as a spacer layer between two magnetic layers.

28. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. as modified by Hokkyo et al. as applied to claims 1-7, and 9-13 above, and further in view of Kanbe et al. (US6221508).

29. Sugita et al. as modified by Hokkyo et al. does not teach a magnetic recording apparatus comprising a magnetic recording medium, a driving means to drive the magnetic recording medium in a recording direction, a magnetic head provided with a recording section and a reproducing section, a means to relatively move the magnetic

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head against the magnetic recording medium, and a recording/reproducing signal treating means to input recording signals to the magnetic head and to output reproducing signals from the magnetic head, wherein the magnetic recording medium is a magnetic recording medium as defined in claim 1, as required by claim 14.

30. However, Kanbe et al. teaches a magnetic storage apparatus that comprises a magnetic head assembly, a head drive unit, a processor unit for processing recording and playback signals from the head, a magnetic medium, and a drive unit for rotation of the magnetic medium (column 6, lines 20-32). The magnetic head comprises a recording and a reading element (column 6, lines 35-37). The magnetic medium is a multilayer magnetic media comprising a substrate, 1 or more underlayers, a recording layer, and a protective layer (column 7, lines 24-49).

31. Therefore it would have been obvious to one with ordinary skill in the art to utilize the magnetic recording medium described by Sugita et al. as modified by Hokkyo et al. in the magnetic recording apparatus described by Kanbe et al.

32. One would have been motivated to utilize the recording media of Sugita et al. in a recording apparatus such as that described by Kanbe et al. due to the teaching in Kanbe et al. that such an apparatus is suitable for reading and recording magnetic media that comprises at the most basic level a substrate, one or more underlayers, and recording layer, and the teachings in Sugita et al. as modified by Hokkyo et al. of a magnetic recording media that comprises a substrate, multiple underlayers, and a recording layer.

R sponds to Arguments

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33. Applicants arguments dated 2/3/03 have been considered but are not persuasive. In the instant case, the applicant argues that the Sugita reference relates to a magnetic recording medium that is a magnetic tape or flexible disk, as shown by column 1, lines 1-40. The applicant asserts that the claims as written on the other hand, relate to a magnetic recording medium for a hard disk drive including a combination of a magnetic recording medium and a recording head, and that in light of this fact the applicants believe the invention is defined over that of Sugita in combination with Hokkyo.

34. The examiner respectfully disagrees. The requirement that the magnetic media be used as a hard disk, or even that the non -magnetic substrate be formed of a rigid material is never presented. Thus, applicant's arguments are found to be unpersuasive as they are directed to subject matter that is not presented in the claims. The applicant is respectfully reminded that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

35. The applicant further argues that Sugita et al. does not teach one of the objects of the presently claimed invention, that object being the improvement in the surface roughness of a soft magnetic layer, thereby improving the noise of the recording medium. It is respectfully noted that nowhere in the claims is the surface roughness of a soft magnetic layer claimed. Thus, this argument is largely moot as it is directed towards subject matter that is not in the claims. However, for the sake of argument, the examiner agrees that Sugita does not teach this feature. However, Hokkyo clearly teaches the

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benefits of improving the smoothness of a magnetic recording medium by incorporating a smoothness-controlling layer between the substrate and subsequent layers formed on the substrate. Thus, there is clear motivation to one of ordinary skill in the art to improve the smoothness of the Sugita medium, with a reasonable expectation of success.

36. It is noted that applicants have presented no arguments against the combination of Sugita with Hokkyo and Lal or the combination of Sugita with Hokkyo and Kanbe. Accordingly, these rejections stand as written.

Examiners Note

37. The applicant should note that the claim 3 was rejected in the prior office action under 35 U.S.C 112 2nd paragraph. Although the examiner acknowledges that the this rejection was not explained as clearly as it could have been in the prior office action, it is clear that claim 3 possessed the same insufficient antecedent basis problem as claim 2 did. The examiner clearly explained the problem with claim 2 in prior action, and thus clearly explained the problem with claim 3. Thus, the rejection of claim 3 under 35 U.S.C 112 2nd paragraph in this action does not constitute a new grounds of rejection and thus a non-final action is not warranted.

Conclusion

38. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhler whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

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March 17, 2003



Paul Thibodeau
Supervisory Patent Examiner
Technology Center 1700